NAVAL BASE KITSAP
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Addendum to the Third Five-Year Review Bremerton Naval Complex (Puget Sound Naval Shipyard Complex Superfund Site) Bremerton, WA

June 2016

A Five-Year Review addendum is generally completed for remedies where the protectiveness determination is deferred until further information is obtained. When deferring protectiveness in the Five-Year Review report, the Navy, as lead agency, typically provides a timeframe for when the information will be obtained, and a protectiveness statement can be made. This addendum documents progress since the Third Five-Year Review for Bremerton naval complex (BNC) (ref. a), provides additional recommendations, and provides revised protectiveness determinations for the OU A, OU B marine, and OU B terrestrial remedies, which were deferred in the Third Five-Year Review. This site is identified on the National Priorities List as the Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, but the complex is commonly referred to as the Bremerton naval complex, and that name is generally used in this report.

The Third Five-Year Review report for the Bremerton naval complex in Bremerton, WA, was signed by Captain P. Dawson, Commanding Officer, Naval Base Kitsap on 12 October 2012. The protectiveness statements at that time were:

> An overall protectiveness determination of the remedies for the BNC site cannot be made at this time and will be deferred until further information for three OUs is obtained, as described below. Following collection and evaluation of the necessary additional information, protectiveness determinations will be made for the site as a whole, and the individual OUs, no later than December 31, 2015.
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> A protectiveness determination of the remedies for OU A, OU B Marine, and OU B Terrestrial cannot be made until further information is obtained. The protectiveness of the OU B Marine remedy has come into question, based on evidence of releases through the groundwater and a primary storm drain line in the western portion of OU B terrestrial, and the potential release of fill materials from Charleston Beach at OU A. OU B Marine and OU B Terrestrial are inextricably linked. The future protectiveness of the OU B Marine remedy will depend on the accurate assessment of potential ongoing sources to the marine environment from OU B Terrestrial, and implementing successful source control measures at OU B Terrestrial. Information needed to assess the protectiveness of the remedies for OU B Marine, OU B Terrestrial, and OU A will be developed through ongoing Navy investigations. These investigations include studies of terrestrial sources, mercury movement through the marine food web, and the nature of intertidal sediments at Charleston Beach. In addition, elevated PCB and mercury levels have been reported in some sediment samples collected during pre- and post-construction sampling for in-water construction projects at BNC. The

implications of these findings for the remedy are still being evaluated. The results of these investigations are presently projected to be available by approximately 2015, at which time, the protectiveness of the remedies for OU A, OU B Marine, and OU B terrestrial will be reevaluated. In the interim, the pathways for human exposure are being controlled.

The cleanup action at OU C, selected under the state MTCA regulation, remains protective of human health and the environment.

The remedies implemented at OU NSC and OU D currently protect human health and the environment. Exposure pathways and infiltration pathways that could increase contaminant migration and result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the RODs were executed. Conditions at the time of ROD execution were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled. In order for the remedies to be considered protective for the long term, the recommendations and follow-up actions listed in Table 8-1 need to be addressed in a timely manner. Future protectiveness will continue to be assessed during and after implementation of these actions based on monitoring of COC concentrations, trend analyses, and completion of follow-up actions.

At the time of the Third Five-Year Review, there was insufficient information to determine whether the remedial actions at OU A, OU B Marine, and OU B Terrestrial were protective with respect to seafood consumption by subsistence harvesters. This addendum addresses potential sources of mercury and PCBs to the marine environment from OU A and OU B terrestrial, mercury risk in OU B marine, reaching cleanup goals for PCBs in OUB marine, and the protectiveness statements for OU A, OU B marine, and OU B terrestrial.

At the Navy's request, EPA agreed to revise the due date for the addendum to the Third Five-Year Review from December 31, 2015 to June 30, 2016.

Below is additional information concerning remedy protectiveness at OU A, OU B Marine, and OU B Terrestrial.

OU A

OU A, Erosion Protection and Sediment Sampling

As part of the 2014 OU B Marine monitoring sampling plan, six intertidal sediment samples were collected from OU A, Charleston Beach in May 2015, and analyzed for PCBs and metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc), to ensure there was no contaminant migration from OU A to OU B Marine. PCBs were undetected, and mercury was below background (assumed to be 0.2 ppm, as per ref. b). The non-COC metals were also lower than WA state sediment cleanup objective (SCO). The results are included here as Attachment (1) and will be reported in the Phase II 2014 Marine Monitoring Report, which is scheduled to be final by July 31, 2016, and included in the Fourth Five-Year Review, being performed in the coming year.

Also at OU A, Charleston Beach, fish mix beach nourishment was placed on the eroding soft beach in late summer 2015 to ensure protectiveness of the remedy. In addition, the OU A shoreline is visually inspected in accordance with the Operations and Maintenance Plan every six months to ensure that less than two feet of each of the three erosion gauges is visible. During the

latest inspection conducted on November 18, 2015, none of the gauges had more than the allowable two feet exposed. In conjunction with the intertidal sediment monitoring, these actions ensure the OU A remedy is protective in the short term. A design for alternate shoreline geometry has been completed and is under consideration by the Navy. The purpose of the alternate shoreline geometry would be to provide longer term site stability and protectiveness.

OU B Marine

OU B Marine, Compliance with ROD

OU B Marine is composed of all near shore marine environment associated with the BNC, reaching generally east and west along the shorelines of OUs A, NSC, and B Terrestrial and extending an average of approximately 1,500 feet outward into Sinclair Inlet. The site includes a total of approximately 270 acres of sub tidal land.

The remedial investigation (reference c) concluded that the primary threat posed by conditions within OU B Marine was human health risk associated with the presence of polychlorinated biphenyls (PCBs) in marine seafood tissues. Potential risks to subsistence seafood consumers by PCB levels measured in English sole constituted the basis for the marine remedy. The Remedial Action Objective (RAO) of reducing the concentration of PCBs in sediment to below the Minimum Cleanup Level (MCUL) in the biologically active zone within OU B marine was established as a measure expected to reduce PCBs in fish tissue over time.

Construction of the OU B marine remedy was initiated prior to the first five-year review in 2002, and the final component of the remedy was completed in March 2004. The primary remedy components included dredging and disposal of contaminated sediments, placement of a clean cap over other contaminated sediments, and placement of a thin layer of clean sediments in one area for enhanced natural recovery (ENR). The dredged sediments were disposed in an excavated seafloor confined aquatic disposal (CAD) pit and capped with clean materials. The remedy also included shoreline stabilization measures at a location in the center of the BNC shoreline where slumping is believed to have occurred. The remedy also relies on ongoing processes of natural sediment recovery.

Post-remedy monitoring of OU B Marine is summarized below:

	2003	2005	2007	2010	2012	2014-2015
CAD Pit						
Hydrographic Survey (Bathymetry)	X	X	X	X	X	
Sediment Cores	X	X	X	X	X	
Sub-bottom Profiling	X	X	X	X	X	X
Sediment Profile Imaging (SPI)	X					
CAD Pit Apron Sediment Sampling	X	X				
OU A Shoreline (Cap and ENR) Area						
Hydrographic Survey (Bathymetry)	X	X	X	X	X	
Sub-bottom Profiling	X					
Sediment Profile Imaging	X					
Site 1 Shoreline Stabilization Monitoring	X	X				
500-foot grid Surface Sediment Sampling	X	X	X	X	X	X
1500-foot grid Surface Sediment Sampling	X	X	X	X	X	X
English Sole Tissue Analysis	X		X	X	X	X
Sea Cucumber Tissue Analysis	X					

Notes:

i. The hydrographic survey at the CAD Pit and OU A Shoreline, as well as the collection of sediment cores at the CAD Pit were suspended after 2012 as agreed with state and federal agencies in technical team meeting held 12/19/13.

ii. According to the terms of the 9/19/03 Final 2003 OU B Marine Monitoring Plan, since sediment profile imaging (SPI) at the CAD Pit and OU A Shoreline confirmed strong recolonization of sediments by benthic fauna, no further SPI was deemed necessary.

iii. According to the 7/21/06 Final 2005 Marine Monitoring Report, CAD Pit apron sediment sampling was suspended since the results were below the established target value.

iv. As documented in the 2/02/06 Final 2003 Marine Monitoring Report, sub-bottom profiling at the OU A Shoreline was suspended after 2003 since this survey did not yield useful information.

v. Monitoring of shoreline stabilization measures at Site 1 (Mooring A/Pier 3 area) was suspended after 2005 based on the conclusion that the site is stable, as documented by a report of an inspection and bathymetric survey in an appendix to 7/21/06 Final 2005 Marine Monitoring Report.

vi. The 7/21/06 2005 OU B Marine Monitoring Report noted that English sole sampling was not included because it was anticipated that reductions of PCB levels in tissues was likely to occur slowly, and cleanup activities had been completed in OU B Marine.

vii. According to the 9/19/03 Final 2003 OU B Marine Monitoring Plan, sampling and analysis of sea cucumbers was identified as a one-time event to characterize typical PCB concentrations.

OU B Marine, PCB Risk:
Trend analysis on the three rounds of post-remedy sediment monitoring results (2003, 2005, and 2007) predicted that the sediment cleanup level of 3 mg/kg OC total PCBs for OU B Marine could be achieved by approximately 2012 (see ref. d). The 2010 data supported that trend line (ref. e). However, the 2012 round (ref. f) showed an increase of concentrations, inconsistent with the downward trend set by the previous four rounds. An additional round of sediment sampling was performed in 2014.

Reference (g) provides results of the Phase 1 2014 OU B marine monitoring. This report concludes that the median geomean PCB concentration within OU B marine has met the cleanup level of 3 mg/kg OC for sediments, in accordance with the 2014 target date specified by the ROD. In addition, the Sinclair Inlet-wide goal of 1.2 mg/kg OC total PCBs for sediments was met.

Complying with the ROD cleanup level and goal verifies that the OU B marine remedy is protective for PCBs.

The uptick witnessed in the PCB concentration in the previous round in 2012 identified a concern for the long-term stability of the remedy. A decision framework that takes into account both PCBs and mercury is being developed. A confirmatory round of PCB monitoring is anticipated to be planned in the future by the project team.

Data from the pre- and post-construction monitoring of sediments in OU B marine identified an area under Pier 7 that had higher levels of PCBs. A pilot scale test of activated carbon amended cap was undertaken in October 2012. The project included the placement of material with follow up monitoring over a three year period, including SEA Rings, SPI, and direct measurement of contamination. A report is due in summer of 2016.

OU B Marine, CAD Integrity:
The 2014 Marine Monitoring Report (ref. g) also contains the sub-bottom profile data that verifies that the CAD pit cover is intact and does not show thinning, which responds to another concern identified in the Third Five-year Review.

OU B Marine, Mercury Risk
The 2010 Technical Memorandum that evaluated a human health risk for mercury in sediment and seafood (ref. h) concluded that, if seafood is consumed at 95th percentile Suquamish consumption rates, the mercury Hazard Quotients (HQs) for total seafood consumption exceeds the target health goal of 1 in both Sinclair Inlet and non-urban reference areas of Puget Sound. The HQs for Sinclair Inlet are 9 for both adults and children. HQs for the reference areas are 4 for both adults and children. The incremental (Sinclair Inlet minus reference area) HQ is *5* if rockfish concentrations are not age-adjusted; the incremental HQ is 4 if rockfish concentrations are age-adjusted.

For subsistence exposure scenarios, Sinclair Inlet hazards were driven by rockfish in the pelagic fish seafood group, followed by shellfish, and then salmon. The potential increased hazards to tribal children consuming seafood containing both mercury and PCBs were also of concern. This analysis suggested mercury should be considered a chemical of concern for BNC.

The Tech Memo also identified significant assumptions in the data sets and exposure assumptions that, if changed, would have an impact on the total incremental hazards above the non-urban reference areas and thus the conclusions of the risk evaluation. For example, the risk evaluation assumed that 100 percent of seafood consumed is harvested from Sinclair Inlet, that mercury concentrations in migratory salmon collected from Sinclair Inlet are due entirely to sediment concentrations in Sinclair Inlet, that rockfish habitat in Sinclair Inlet could support tribal consumption, and that existing data represent current conditions. Given these assumptions and other uncertainties associated with the conclusions of the Tech Memo, the Navy planned to collect additional sediment and tissue data.

In 2013, a QAPP (ref. i) was finalized for sediment and tissue collection in Sinclair Inlet and reference areas, and field work was completed. The data from this study (ref. j) has been combined with all the mercury studies and information on Sinclair Inlet mercury, into the draft Supplemental Mercury Investigation Report (ref. k). This report, when finalized, will likely support a focused feasibility study, which the Navy is expecting to perform to identify and evaluate potential alternatives for reducing human health risks from mercury in Sinclair Inlet.

OU B Terrestrial

BNC-Wide Pavement and Storm Drain Repairs

Pavement conditions and repairs are reported in the Annual Remedy Inspection Report for the BNC Terrestrial operable units. Select catch basin and manhole conditions are reported in the Wet Weather and the OU A Winter Shoreline Inspection Report through 2015, and will be reported subsequently in the Annual Remedy Inspection Report for BNC Terrestrial operable units. Catch basin cleaning is performed throughout BNC on a rotating basis and completion is recorded in the facility's work order system. The Navy is formalizing the reporting of catch basin cleaning, and catch basin, manhole, and pavement repair status and completion to BNC stakeholders in the Annual Remedy Inspection Report for BNC Terrestrial operable units. The sewer repair that is expected to control seepage of mercury from the subsurface of BNC to OU B marine is planned to be included in alternatives in the focused feasibility study for mercury, which will start summer 2016.

Institutional Control (IC) Work Plan Revision for Vapor Intrusion Information

The Second Five-Year Review for BNC (ref. l) identified vapor intrusion as a potential pathway of exposure from vapor migrating from the subsurface to indoor air. Two initial studies in 2009 (ref. m and ref. n), and a follow-up report (ref. o), reviewed this pathway and evaluated whether remedial action was required to limit exposures to volatilized chemicals from site groundwater.

Vapor intrusion was identified as possible in three areas of BNC, which were assessed using available soil and groundwater contaminant concentration data. No health risk in excess of target goals was found; and, the preponderance of evidence indicated a vapor hazard in excess of actionable risk levels is unlikely for building workers in the affected areas. However, the Third Five-Year Review (ref. a) recommended that the IC Work Plan include a provision for assessing the potential for vapor intrusion resulting from future remodeling in the trichloroethene (TCE) northern plume area, which is described in the Final Vapor Intrusion Follow-Up Report (ref. o). Therefore, a third section, Section 3, was added to the IC Work Plan in 2014. When facilities in the TCE northern plume area are proposed for construction or remodeling, the potential for vapor intrusion will be assessed. The results, and any proposed mitigation measures, will be presented to EPA and Ecology prior to construction, with the approved measures implemented during

construction. The 2015 IC Work Plan (ref. p) has been provided to the BNC Contracting and Asset Management offices.

OU D

Annual Inspection of OU D

In May 2013, the Navy entered into a Memorandum of Agreement (MOA) with the City of Bremerton (ref. q). This MOA details the requirements for the annual IC inspections at Harborside Fountain Park (OU D). The annual IC report from the City of Bremerton is incorporated into the Annual Remedy Inspection Report for the BNC Terrestrial operable units.

Issues and Recommendations Updated From The Third Five-Year Review

The following issues, recommendations and follow-up actions have been updated from reference a. Item numbers are a continuation from the Third Five-Year Report.

Item	Recommendation/ Follow-Up Action			Affects Protectiveness	
	Original	Update	Follow up	Current	Future
1	Develop and implement a reliable BNC-wide program for executing repair work for pavement and storm drains in a timely manner after maintenance requirements are identified. Clearly document completed repairs and catch basin cleaning.	Pavement conditions and repairs are reported in the Annual Remedy Inspection Report for the BNC Terrestrial operable units.	Navy is working to formalize the reporting of catch basin cleaning, prioritize and formalize catch basin, manhole, and pavement repair status, and report to BNC stakeholders in the Annual Remedy Inspection Report.	No	Was Yes, Now No
2	Revise the IC plan to include a provision for assessing the potential for vapor intrusion resulting from future remodeling in the TCE northern plume area.	The Navy has revised the IC plan to include a provision for assessing the potential for vapor intrusion resulting from future remodeling in the TCE northern plume area.	None	No	Was Yes, Now No
3	Update the IC plan to ensure that new discoveries are promptly reported to EPA. Improve the administrative processes for implementing the plan.	No new discoveries have occurred, but stakeholders have been notified twice of the potential for discoveries and kept abreast of responses.	Update the IC plan to ensure that new discoveries are promptly reported to EPA. Improve the administrative processes for implementing the plan.	No	Yes

4	Complete the 90 percent design of the remedy repair.	The Navy completed the design of a remedy repair.	Continue to add beach material to prevent erosion as an interim measure.	Was Yes, Now No	Was Yes, Now No
4 cont	Sample and analyze intertidal sediments as part of OU B Marine monitoring. Depending on the results of the sampling, consider the need for upland sampling or design modifications.	The Navy sampled and analyzed intertidal sediments as part of OU B Marine monitoring. Sediment results indicated there is no contaminant pathway from OUA to OUB marine.	Will be reported in 2014 MMR Ph.II.		Yes
5	Complete the analysis of ongoing transport of metals COCs from the terrestrial to marine environment, as well as potential remedies.	Mercury, the metal COC for OUB marine, is being evaluated in the Supplemental Mercury Investigation Report. FFS will prescribe corrective actions.	Supplemental Mercury Investigation Report will be finalized and form basis for the FFS.	Yes	Yes
6a	Collect additional data to reflect current conditions in Sinclair Inlet and reduce uncertainties associated with the data that were used for the human health risk evaluation technical memorandum.	Data report finalized in 2015. Draft Supplemental Mercury Investigation Report is under review.	Supplemental Mercury Investigation Report will be finalized and form basis for the FFS.	Yes	Yes
6b	Perform a focused feasibility study to document and collate studies related to mercury in sediments, and identify and evaluate potential approaches for reducing human health risks from mercury in Sinclair Inlet. The study will include an evaluation of source control (contaminant transport from the uplands to the marine waters and sediment).	FFS is commencing.	FFS will be completed.	Yes	Yes

6c	If data support, develop a Record of Decision amendment or Explanation of Significant Differences to address mercury as a contaminant of concern, select cleanup levels and select the preferred alternative of the focused feasibility study.	Navy is planning to develop a Record of Decision amendment to address mercury as a contaminant of concern, select cleanup levels and select the preferred alternative of the focused feasibility study.	Develop Record of Decision amendment based on FFS preferred alternative.	Yes	Yes
7	The Navy will make a detailed comparison between historical records regarding the CAD pit sediment cover placement and recent reports of possible thinning of the cover material.	The Navy made a comparison between historical records regarding the CAD pit sediment cover placement and recent reports of possible thinning of the cover material.	Action complete	No	Was Yes, Now No
8	Establish a process for evaluating the data generated from recent in-water construction projects relative to the protectiveness of the OU B Marine remedy. Consider the potential application of this process to other future data generated from outside of the OU B Marine long-term monitoring program.	The Navy evaluated the data generated from recent in-water construction projects relative to the protectiveness of the OU B Marine remedy. Analysis was part of 2012 Marine Monitoring Report. No significant difference was found between pre and post construction data and LTM data.	Data from pre and post construction sampling will be considered in the FFS. The project team will include, in the development of the Decision Framework, ways to evaluate and include the MILCON data	Was Yes, Now No	Was Yes, Now No
9	Transition to EPA and Ecology the lead regarding engagement with the City of Bremerton and initiate a meaningful dialog that allows additional assessment and effective IC inspections.	EPA led engagement with the City of Bremerton and initiated a meaningful dialog that allows additional assessment and effective IC inspections.	Action complete	No	Was Yes, Now No

10	Finalize the existing remedy evaluation report prepared by the Navy without City input.	City of Bremerton does annual IC inspections in accordance with MOA with Navy. Navy incorporates this inspection into the Annual Remedy Inspection Report for the BNC Terrestrial operable units.	Continue to incorporate city inspection into Navy Annual Remedy Inspection Report	No	Was Yes, Now No

Protectiveness Statements

Based on new information and/or actions taken since the Third Five-Year Review completion date, the overall protectiveness statement for BNC is revised as follows:

> An overall protectiveness determination of the remedies for the BNC site cannot be made at this time and will be deferred until further information for two OUs is obtained, as described below. Following collection and evaluation of the necessary additional information, protectiveness determinations will be made for the site as a whole and the individual OUs during the next five-year review.

The protectiveness statement for OU A is revised as follows:

> As a result of satisfactory results of intertidal sediment sampling, and erosion protection measures being implemented, OU A is determined to be short-term protective.

The protectiveness statement for OU B Marine is revised as follows:

> The Final 2014 Phase I Marine Monitoring Report (ref. e) shows the PCB sediment clean up level for OU B marine and goal for Sinclair Inlet was achieved in 2014 as specified by the ROD, which will be confirmed by an additional sampling event at an as of yet unspecified future date. However, the review of the human health risk evaluation associated with mercury has concluded that hazard quotients exceed the target goal of one (1) for seafood consumption in Sinclair Inlet at tribal consumption rates. Therefore, mercury should be considered a chemical of concern for BNC OUB marine. Additional data has been collected to refine knowledge of mercury and methyl mercury in sediment, water and biota in Sinclair Inlet and reference areas. Once the Supplemental Mercury Investigation Report (ref. i) is finalized, a focused feasibility study will be conducted that specifically addresses mercury contamination in Sinclair Inlet, and presents alternatives for reducing human health risks associated with mercury. The protectiveness determination for OU B marine is, therefore, deferred until the next Five-Year Review.

The protectiveness statement for OU B Terrestrial is revised as follows:

> OU B Terrestrial poses no direct exposure, though it may be a source to OU B marine. The investigation and implementation of any needed remedies for OUB marine is not yet

complete. Therefore, protectiveness determination at OU B terrestrial is deferred to the next Five-Year Review.

Next Five-Year Review

The next five year review will be completed by 12 October 2017.

Signature: _____

T. A. ZWOLFER
Captain, U.S. Navy
Commanding Officer, Naval Base Kitsap

Attachment:
(1) 2014-15 Charleston Beach intertidal sediment sampling (data table)

References:

a. Third Five-Year Review Bremerton Naval Complex (final) dated October 2012
b. Washington State Sediment Cleanup Users Manual II, (SCUM II)
c. Final Remedial Investigation Report Operable Unit B, Bremerton Naval Complex, dated March 2002
d. 2007 Marine Monitoring Report, Operable Unit B, Bremerton Naval Complex, (Final) dated 2 July 2009
e. 2010 Marine Monitoring Report, Operable Unit B, Bremerton Naval Complex, (Final) dated 17 April 2012
f. 2012 OU B Marine Long-term Monitoring Report (Final), PSNS Superfund Site, Bremerton Naval Complex, dated 15 Jan 2016
g. 2014 OU B Marine Phase I Monitoring Report (Final), PSNS Superfund Site, Bremerton Naval Complex, dated 10 March 2016
h. Technical Memorandum, Human Health Risk Evaluation of Mercury in Sinclair Inlet Seafood dated 12 August 2010.
i. Sinclair Inlet Marine Monitoring Sampling and Analysis Plan (Final) 24 June 2013
j. Sinclair Inlet Marine Monitoring Data Report (Final) 23 Feb 2015
k. Supplemental Mercury Investigation Report (Draft) dated 1 March 2016
l. Second Five Year Review, Bremerton Naval Complex, dated 11 October 2007
m. Phase I Vapor Intrusion Evaluation: Conceptual Site Model Report, Bremerton Naval Complex, Bremerton, Washington. February 2009
n. Phase II Vapor Intrusion Study: Vapor Intrusion Pathway Quantitative Assessment, Bremerton Naval Complex, Bremerton, Washington. October 2009
o. Final Vapor Intrusion Follow-Up Report, Operable Unit B Terrestrial, Bremerton Naval Complex, Bremerton, Washington. March 13, 2012.
p. Institutional Control Work Plan (final), Bremerton Naval Complex, dated 22 June 2015 .
q. Memorandum of Agreement Between The Department of the Navy and City of Bremerton dated 6 May 2013